KADOMSKAYA, K.P., Cand Tech Sci—(diss) "Limitation of internal over-voltage in the electric tranmissions of the alternating current by the use of two-step switches." Len, 1958. 20 pp (Min of Higher Education USSR. Len Polytech Inst im M.I.Kalinin), 100 copies (KL,30-58,127)

8(2)   SOV/105-59-8-2/28

AUTHORS: Levinshteyn, M. L., Docent, Candidate of Technical Sciences,
            Kadomskaya, K. P., Candidate of Technical Sciences

TITLE: Requirements Placed Upon Arresters Used as a Protection Against
            Internal Overvoltages

PERIODICAL: Elektrichestvo, 1959, Nr 8, pp 9 - 14 (USSR)

ABSTRACT: In connection with the conversion of the electrical trans-
            mission lines from 400 kv to 500 kv the requirements placed
            upon arresters used as a protection against internal over-
            voltages are investigated. A study of internal overvoltages
            in the transmission line Votkinskaya GES (Votkinskaya Hydro-
            electric Power Station) - Sverdlovsk lead to the following
            conclusions. An arrester with given characteristics is capable
            of interrupting an arc provided that the forced voltage
            component in the line does not exceed $(1.3-1.4)U_{ph}$. In order

            to arrive at a reliable overvoltage protection other measures
            must be taken which go beyond the installation of arresters.
            The circuit breakers must be installed in such a way as to
Card 1/3   secure a selective disconnection of the breaker located at

Requirements Placed Upon Arresters Used as a   SOV/1o5/59-8-2/28
Protection Against Internal Overvoltages

the buses with the smaller power and similarly a selective
closing of the breaker at the buses with the higher power.
The automation of the system must secure a reliable delay of
the breakers of 1-2 periods. Measures must be taken to
arrange for a discharge of the line capacity during the
interval of automatic reclosure, and to place electromagnetic
voltage transformers close to the line. It appears to be
desirable that when the system is operative, all main connec-
tions are under load. The circuit breakers of modern trans-
mission lines with 400 and 500 kv must be equipped with ohmic
resistances shunting their main contacts. Recommendations
are advanced concerning the improvement of the characteristics
of the arrester developed in the Vsesoyuznyy elektrotekhniches-
kiy institut im. Lenina (All-Union Institute of Electrical
Engineering imeni Lenin). There are 9 figures, 1 table, and
2 Soviet references.

Card 2/3

Requirements Placed Upon Arresters Used as a   SOV/105-59-8-2/26
Protection Against Internal Overvoltages

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. Kalinina (Lenin-
grad Polytechnic   Institute imeni Kalinin)

SUBMITTED: March 12, 1959

Card 3/3

KADOMSKAYA, K.P., kand.tekhn.nauk; LEVINSHTEYN, M.L., kand.tekhn.nauk;
CHERTOUSOVA, V. M., insh.; SHAKHAEVA, O. M., insh.

Higher-order harmonics in electric power transmission lines
without cutouts at the higher voltage end. Izv. vys. ucheb.
zav.; energ. 5 no.1:15-23 Ja '62.   (MIRA 15:2)

1. Leningradskiy politekhnicheskiy institut imeni M.I.Kalinina.
                   (Electric power distribution)

GRIBOV, A.N., kand.tekhn.nauk, dotsent; KADOMSKAYA, K.P., kand.tekhn.nauk;
CHERTOUSOVA, V.M., inzh.

Methods for calculating the voltages of an open-circuited power
transmission line with consideration of the local load and saturation
of transformers and reactors. Izv.vys.ucheb.zav.; energ. 5
no.4:33-40 Ap '62.   (MIRA 15:5)

1. Leningradskiy politekhnicheskiy institut imeni M.I.Kalinina.
            (Electric power distribution)

KADOMSKAYA, K.P., kand.tekhn.nauk; KAPLAN, V.V., kand.tekhn.nauk; NASHATYR', V.M., kand.tekhn.nauk; SHCHERBACHEV, O.V., kand.tekhn.nauk

Problem concerning the use of two-way switches with shunting resistances. Elektrichestvo no.8:61-65 Ag '62. (MIRA 15:7)

1. Leningradskiy politekhnicheskiy institut imeni Kalinina.
(Electric switchgear)

KADOMSKAYA, K.P.(Leningrad); LEVINSHTEYN, M.L. (Leningrad); SHTERENBERG, G.P. (Leningrad)

Solution of the equations of a long electric power transmission line using numerical and digital computers. Izv. AN SSSR. Energ. i transp. no.4:508-513 Jl-Ag '63.   (MIRA 16:11)

KADOMSKAYA, K.P. (Leningrad); SHTERENBERG, G.P. (Leningrad)

Study of internal overvoltages in electrical systems using electronic digital computers. Izv. AN SSSR. Energ. i transp. no.6:731-741 N-D '63. (MIRA 17:1)

KADOMSKAYA, K.P.; LEVINSHTEYN, M.L.; CHERTOUSOVA, V.M.; SHAKHAYEVA, O.M.

Comparison of the applicability of small parameter and harmonic
balance techniques in calculating the periodic operating conditions
of electric power transmission lines with nonlinear parameters.
Izv.vys.ucheb.zav.;energ. 6 no.1:117-118 Ja '63.   (MIRA 16:2)

1. Leningradskiy politekhnicheskiy institut imeni M.I. Kalinina.
        (Electric power distribution)
        (Electric lines—Overhead)

KADOMSKAYA, K.P., kand.tekhn.nauk; LEVINSHTEYN, M.L., dotsent, kand.tekhn.nauk;
CHERTOUSOVA, V.M., inzh.

Methods for calculating higher harmonic voltages in systems with two
nonlinear elements. Izv. vys. ucheb. zav.; energ. 6 no.10:27-35
O '63.   (MIRA 16:12)

1. Leningradskiy politekhnicheskiy institut imeni M.I.Kalinina.
Predstavlena kafedroy tekhniki vysokikh napryacheniy.

L 16385-65   RAEM(1)/ESD(dp)/SSD/BSD/AFWL/ASD(a)-5/AFM(dr)/AFETR(A)-T
ACCESSION NO: AP5011553

AUTHOR: Kadomskaya, K. P.(Leningrad), Kantorovich, M. K. (Leningrad),
Shterenberg, G. P. (Leningrad)
TITLE: Calculation of the internal overloads on long range power trans-
lines using an electronic digital computer

SOURCE: AN SSSR. Izvestiya. Energetika i transport, no. 5, 1964, 587-592

TOPIC TAGS: digital computer, D'Alambert method, Runge Cutt method, power transm-
mission, discharge device, power overload, magnetic circuit, Euler method, memoriz-
ing device, computer programming

ABSTRACT: The use of electronic digital computers to calculate the internal over-
loads on long-range power transmission lines calls for the solution of the ordinary
differential equations describing the transient conditions at the terminal instal-
lations, and the equations of the line recorded in the D'Alambert form. Control
calculations of the overloads on a 255-kV transmission line were made with a view
to checking the accuracy of the various integration methods. The Runge-Cutt inte-
gration method, with a step interval of 0.17 milliseconds, was adopted and showed
a margin of error of over 3%, while the error in the Euler method of integration
was about 5%. The solution of these equations by a digital computer requires that
it memorize not the variables involved but their derivatives, which should be
Card 1/2

L 16385-65

ACCESSION NR: AP4049218

defined approximately. The approximate definition of the derivatives at the time of the current drop adds a certain amount of error to the solution. The approximate definition of the derivatives may lead to considerable unpredictable error in the case of three-phase power-transmission systems containing . . . at several points. It should be pointed out that the method of solving the equation proposed by the authors reduces the necessary number of cells in the memorizing device required for storing the program (from 9 cells by the Runge-Kutt method to 5 by the proposed method). In both cases it takes 60 full cells to memorize the delayed functions. The proposed method thus makes it possible to simplify the programming problem and reduce the time required to solve it with a tolerable degree of accuracy. Orig. art. has: 4 figures and 6 numbered formulas.

ASSOCIATION: none

SUBMITTED: 30Apr64   ENCL: 00   SUB CODE: DP, EE

NO REF SOV: 000   OTHER: 000

Card 2/2

L 19445-65   EWT'd\/EED-2/EWP(1)   Po-4/Pq-4/Pg-4/Pk-4   IJP(c\/ASD'a\-5'(A0--. --
AFWD(p)/AFTC(b)/ESD(dp)/ESD(t)   GG/BB
ACCESSION NR: AP4049459   S/0143/64/000/010/0015/0024

AUTHOR: Gusev, Yu. M. (Engineer); Kadomskaya, K. P. (Candidate of technical
sciences); Levinshteyn, M. L. (Candidate of technical sciences. Docent)

TITLE: Analog-computer simulation of corona on wires of a-c power
transmission line

SOURCE: IVUZ. Energetika, no. 10, 1964, 15-24

TOPIC TAGS: analog system, corona, corona discharge, power transmission line

ABSTRACT: As analytical methods of calculating corona on power transmission
lines are very complicated, the use of O. V. Shcherbachev's corona simulator
(Trudy LPI. no. 1. 1954) combined with an analog computer is suggested. A
single equivalent Γ-network, which reproduces the volt-coulomb characteristic
of corona, is employed. The corona-equivalent capacitance is assumed to be
independent of the line voltage; other parameters of the equivalent circuit are

Card 1/2

L 19445-65
ACCESSION NR: AP4049459

computed on the basis of corona loss in a real line. An example of a
single-phase line having a characteristic impedance of 250 ohms (base power
750 Mw) illustrates the method; corona loss is assumed to be 349 kw, and the
resulting reduction of overvoltage due to corona is 6.3% and 14% for the first and
second maxima of the line voltage wave. An approach to solving corona
loss problems is also outlined; simplified diagrams and corona-parameter
equations are given. An allowance for corona in calculating overvoltages on
superhigh-voltage power transmission lines is considered important. Orig. art.
has: 6 figures, 19 formulas, and 1 table.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M. I. Kalinina
(Leningrad Polytechnic Institute)

SUBMITTED: 10Mar64   ENCL: 00

SUB CODE: EE, DP   NO REF SOV: 007   OTHER: 000

Card 2/2

GRUZDEV, Igor' Aleksandrovich; KADOMSKAYA, Kira Panteloymonovna; KUCHUMOV, Leonid Aleksandrovich; LUGINSKIY, Yakov Natanovich; PORTNOY, Marlen Gdalevich; SOKOLOV, Nikolay Ivanovich; NIKOLAYEVA, M.I., red.

[Use of analog computers in electric power systems; methods for studying transient processes] Primenenie analogovykh vychislitel'nykh mashin v energeticheskikh sistemakh; metody issledovanii perekhodnykh protsessov. [By] I.A.Gruzdev i dr. Moskva, Energiia, 1964. 407 p.
(MIRA 18:2)

GUSEV, Yu.M., inzh.; KADOMSKAYA, K.P., kand. tekhn. nauk; LEVINSHETYN,
    M.L., kand. tekhn. nauk, dotsent

Simulation of corona on an a.c. power transmission line using
an analog computer. Izv. vys. ucheb. zav.; energ. 7 no.10:
15-24 O '64.   (MIRA 17:12)

1. Leningradskiy politekhnicheskiy institut imeni M.I. Kalinina.

L

KADOMSKAYA, K.P.; LEVINSHTEYN, M.L.; MIKHAYLOV, Yu.A.; OKOROKOV,
      V.R.; ORLOV, V.N.; POLOVOY, I.F.; KOSTENKO, M.V., prof.
      red.

[Internal overvoltages of high-voltage a.c. networks, 1961-
1963] Vnutrennie perenapriazheniia v elektricheskikh setiakh
vysokogo napriazheniia peremennogo toka, 1961- 1963. Mo-
skva, 1964. 241 p.   (MIRA 18:4)

1. Akademiya nauk SSSR. Institut nauchnoy informatsii.
2. Chlen-korrespondent AN SSSR (for Kostenko).

KADONSKAYA, K.P. (Leningrad); KANTOROVICH, A.Kh. (Leningrad); SHPERBERG, G.P. (Leningrad)

Calculation of internal overvoltages in long-distance power transmission lines using digital computers. Izv. AN SSSR. Energ. i transp. no.5:587-592 S-O '64.   (MIRA 17:12)

KADOMSKAYA, K.P.

Equations of the transient processes of three-phase three-winding
group transformers and autotransformers. Trudy LPI no.242:145-149
'65.   (MIRA 18:8)

GUSEV, Yu.M.; KADOMSKAYA, K.P.; LEVINSHTEYN, M.L.; RODCHENKO, Ye.A.

Mathematical modeling of the characteristics of a discharger used in protection from internal overvoltages. Trudy LPI no.242:150-158 '65.   (MIRA 18:8)

L 01081-67

ACC NR: AP6019200   (A)   SOURCE CODE: UR/0143/66/000/002/0012/0018

AUTHOR: Gusev, Yu. M. (Engineer); Kadomskaya, K. P. (Candidate of technical sciences);
Levinshteyn, M. L. (Candidate of technical sciences, Lecturer)

ORG: Leningrad Polytechnical Institute imeni M. I. Kalinin (Leningradskiy politekh-
nicheskiy institut)

TITLE: Effectiveness of spark connection for reactors designed for limiting internal
surges

TOPIC TAGS: reactor control, electric power transmission, spark gap, electric dis-
charge, voltage stabilization

ABSTRACT: The number of reactors connected to a line under conditions of internal
surge limitation is generally greater than the number necessary for compensating line
capacity during low power transmission. For this reason, some of the reactors are con-
nected to the line through spark gaps to limit internal surges in long-range electric
power transmission. The authors consider the effectiveness of this type of reactor
connection from the standpoint of its effect on maximum overvoltage. Maximum overvol-
tage in switching commutation is a function of the following random quantities: the
emf switching phase Ψ and the breakdown voltage of the reactor spark gap V_{br}. In plot-

UDC: 621.316.435

Card 1/2

L 01081-67

ACC NR: AP6019200

ting the distribution functions for the maximum overvoltages it was assumed that the emf switching phase Y is distributed according to a uniform density law in the interval from -90° to +90° inclusive. Curves are given for the resultant distribution functions for surges which result from line connection over a wide range of spark gap breakdown voltages. A comparison of the mathematical expectations for maximum surges with pulse switching for conventional and spark connection of reactors shows that reactors connected to the line through spark gaps may be treated as straight connections for practical purposes in power transmissions of higher classes of voltage with relatively low natural frequencies. The operating conditions of dischargers in circuits containing reactors with spark connection are analyzed. The results of the study show that operation of the discharger spark gap has practically no effect on the service life of the discharger even under emergency conditions. The use of commutation dischargers behind the reactor spark gaps requires no special measures for preventing breakdown of the discharger spark gaps during operation of the reactor spark gap. Orig. art. has: 4 figures, 3 tables.

SUB CODE:18,20/ SUBM DATE: 10Jul65/ ORIG REF: 004

Card 2/2   vlr

ACC NR: AM5011709

MONOGRAPH

UR

Gruzdev, Igor' Aleksandrovich; Kadomskaya, Kira Pantaleymonovna; Kuchumov, Leonid Aleksandrovich; Luginskiy, Yakov Natanovich; Portnoy, Marlen Gdalevich; Sokolov, Nikolay Ivanovich

Using analog computers in power systems; methods for analyzing transient processes (Primeneniye analogovykh vychislitel'nykh mashin v energeticheskikh sistemakh; metody issledovaniy perekhodnykh protsessov) Moscow, Izd-vo "Energiya", 1964. 407 p. illus., biblio. 5,000 copies printed.

TOPIC TAGS: analog computer, electromagnetism, electric engineering, electric power engineering, mathematic model, computer circuit, computer application

PURPOSE AND COVERAGE: This book is concerned with the application of analog computers to the study of electromechanical and electromagnetic transient processes in power systems. It presents methods for mathematical modeling, circuits for special-purpose devices used in general-purpose computer studies, and examples of completed investigations. The book is intended for engineers at scientific research and planning institutes, workers at power systems, and students taking advanced courses in electric power and electromechanics.

TABLE OF CONTENTS [abridged]:

Foreword - - 3

Card 1/2

UDC: 681.142.33/.34:620.9

ACC NR: AM5011709

Ch. I. Basic decision elements of analog computers - - 5
Ch. II. Special-purpose units of analog computers -. - 62
Ch. III. Equations of the basic elements of an electric system and mathematical
   modeling - - 106
Ch. IV. Modeling of a complex system containing several generators and loads - - 171
Ch. V. Analog-computer solutions of equations of transient processes in excitation
   systems and controllers of primary motor generators - - 209
Ch. VI. Analog computer study of transient processes in power systems - - 260
Ch. VII. Application of analog computers to the calculation of system-generated
   overvoltage in electric systems - - 346

SUB CODE: 09,13,20/ SUBM DATE: 31Oct64/ SOV REF: 083/ OTH REF: 001

Card 2/2

KADOMSKIY, D. Ye.

Kadomskiy, D. Ye.

"Internal excess voltage in transformer equipment for DC power-transmission
systems." Min Higher Education USSR. Leningrad Polytechnic Inst imeni
M. I. Kalinin. Leningrad, 1956. (Dissertation for the Degree of Candidate
in Technical Science).

So: Knizhnaya letopis'
No. 25. 1956. Moscow

GROYS, Ye.S.; KADONSKIY D.Ye.

Internal overvoltages in single-bridge converter substations for
d.c. transmission. Izv. NIIPT no.5:101-126 '60.   (MIRA 14:1)
(Electric substations)

KADOMSKIY, D.Ye.

Harmonic component of voltages acting on the insulation of the
multibridge stages of converter networks. Izv. NIIPT no.7:111-119
'61.

(Electric current converters)
(Electric insulators and insulation)

(MIRA 14:9)

KADOMSKIY, D.Ye.

Protection from overvoltages arising in the rectifier network of the power supply of a high-frequency generator. Izv. NIIPT no.7: 120-132 '61.   (MIRA 14:9)

(Electric current rectifiers)
(Electric power supply to apparatus)

KADOMSKIY, D.Ye.; STUPEL', A.I.

Overvoltages in the Volgograd-Donets Basin d.c. power transmission
line. Izv. NIIPT no.8:134-150 '61.
(Electric power distribution—Direct current)
(MIRA 15:7)

KADOMTSEV, B.B.

ABSTRACT: This paper investigates only electron oscillations, in which con-
nection ions and molecules are considered to be infinitely heavy. Furthermore,
the amplitude of the oscillations is assumed to be small and the distribution
function of the electrons does not deviate much from MAXWELL's distribution $f_o(v)$.
Under the effect of the electric field the velocity of the electrons is increased
by $d\vec{v} = -(eE/m)dt$ and thus the distribution function changes at the first moment
by $df' = (\partial f_o/\partial \vec{v})(e\vec{E}/m)dt$. In the following moments the distribution function change
according to BOLTZMANN'S equation, in which case this modification is determined
in the first stage by the free emission of electrons with gradual removal from the
bundle (as a result of collisions). A formula is given for such electrons as have
not suffered a single collision. - Also the electrons emerging from the primary
bundle (which have suffered at least one collision) cause a certain change of the
distribution function corresponding to equilibrium. By assuming that already one
collision suffices for the establishment of MAXWELL'S equilibrium, this modifica-
tion is represented as a modification of the parameters of MAXWELL'S distribution
(i.e. of density, velocity, and temperature). This process can be described
hydrodynamically and the corresponding hydrodynamic equations are:

CARD 1 / 2

On the Hydrodynamic Description of Plasma Oscillations. PA - 2008

$\partial n/\partial t + n_o div\vec{u} = (\alpha+\beta)n_o I_1$; $\partial\vec{u}/\partial t + \beta u + (\varkappa T_o/mn_o)\nabla n + (\varkappa/m)\nabla T = \alpha T_2$, $\partial T/\partial t + (2/3)T_o div \vec{u} -$
$-\chi \Delta T = (\alpha\beta\beta)(m/3\varkappa)I_3$. Here n and T denote the deviations of density and temper-
ature respectively from the values n_o and T_o respectively, which correspond to
equilibrium, $\vec{u}$ - macroscopic velocity. The term $\beta\vec{u}$ takes account of the slowing
down of electrons by heavy particles, and χ is the coefficient of temperature
conductivity. The expressions on the right side of the equation are due to the
emergence of electrons from the aforementioned distribution. In addition to the
above given equation system there is another equation for the electric field:
div $\vec{E} = -4\pi e(n+n')$ with $n' = n_o I_1$. The latter equation and the aforementioned equa-
tion system represent the required transmission equations. In the case of $\alpha \to \infty$
they go over to ordinary hydrodynamic equations, and in the case of $\alpha = \beta = 0$
the equation div $\vec{E} = -4\pi e(n+n')$ is identical with the dispersion equation to be
obtained by the linearization of the equation by A.A.VLASOV (teorija mnogich
castic (many-particle theory)(1950)). From the aforementioned equation a dis-
persion equation is deduced and its results are discussed.

CARD   2 / 2

ON THE HYDRODYNAMIC DESCRIPTION OF PLASMA OSCILLATIONS, B B Kadomtsev. Soviet Phys JETP

$2R$

KADOMTSEV, BB.

AUTHOR: KADOMTSEV,B.B.   56-4-48/52
TITLE: On Fluctuations in a Gas. (O fluktuatsiyakh v gaze, Russian)
PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Nr 4,
            PP 943 - 944 (U.S.S.R.)

ABSTRACT: The state of a gas is fully described by the distribution
            function of the particles within the phase space $f(\vec{r},\vec{v},t)$, and
            therefore the problem of the fluctuations in a gas is reduced
            to the study of the correlation properties of the distribution
            function. By f, usually the statistical average density of the
            particles in the phase space is understood. This density, of
            course, cannot undergo fluctuations. If the fluctuations of the
            distribution functions are mentioned, the "real" density is

            actually meant: $F(\vec{r},\vec{v},t) = \sum_i \delta(\vec{r} - \vec{r}_i)\delta(\vec{v} - \vec{v}_i)$. Here summation
            extends to all particles. The density F is regarded here as a chance
            order of magnitude which is identical with f only in the average.
            The function F satisfies the equation

            $$\frac{\partial F}{\partial t} + (\vec{v}\nabla)F = \frac{1}{m}\frac{\partial F(\vec{r},\vec{v},t)}{\partial \vec{v}}\int \frac{\partial U(\vec{r} - \vec{r}')}{\partial \vec{r}} F(\vec{r}',\vec{v}',t)d\vec{r}'d\vec{v}'$$

            where m denotes the mass of the molecule and U - the potential
Card 1/3   energy of the interaction of the molecules among one another.

On Fluctuations in a Gas.   56-4-48/52

In a perfect gas the interaction of the particles may be neglected, and in this case $F(\vec{r},\vec{v},t) = F(\vec{r} - \vec{v}(t - t_0),\vec{v},t_0)$ results from the formula just given, and herefrom furthermore:

$$\langle \varphi(\vec{r},\vec{v},t)\varphi(\vec{r}_0,\vec{v}_0,t_0)\rangle = f(\vec{r},\vec{v},t)\delta(\vec{r} - \vec{v}(t - t_0) - \vec{r}_0)\delta(\vec{v} - \vec{v}_0).$$

Here $\varphi = F - f$ applies, and the average is expressed by the pointed brackets.

The following work is destined to find the correlation by taking account of the collisions. In the case of not too dense gases only pair-like collisions need be regarded. In this case the right side in the first-mentioned equation can be given in form of a shock term $S(F?F)$ (which is explicitly given here). The solution of the problem set here is derived step by step. When investigating the problem accurately and in the nonsteady case, the linearized kinetic equation has to be solved by means of a chance source. This equation also describes the further development of the chance disturbance of the distribution function. The kinetic method of investigation discussed here is very illustrative and, above all, applies also to the non-steady case.

Card 2/3.

KADOMTSEV, B.B,

AUTHOR	KADOMTSEV, B.B.	56-7-22/66
TITLE	On the Effective Field in a Plasma. (O deystvuyushchem pole v plasme.- Russian)	
PERIODICAL	Zhurnal Eksperim. i Teoret. Fiziki 1957, Vol 33, Nr 7, pp 151 - 157 (USSR)	

ABSTRACT   The present paper calculates the effective field acting on the charged particles in a plasma by means of the equations by BOGOLYUBOV for the "partial distribution functions". Here the trinary function is represented approximatively by a binary function, which corresponds to a development towards the small quantity $1/nD^3$. Here n denotes the density of the particles and D - Debye's radius. By this fact an analogous development is transferred also to the coupling of the effective field with the mean field. The author confines himself to the computation of a correction which is small only of second order. Apart from the electrons, the plasma is assumed to contain only simple ionised ions of one kind. The author here introduces the conceptions "microscopic density" of the particles in the phase space; the corresponding expressions have the following form for electrons and ions respectively:

CARD 1/2 $F_e = \sum_k \delta(\vec{r} - \vec{r}_k(t)) \delta(\vec{v} - v_k(t))$ and

KH Domicer, B.B

AUTHOR	KADOMCEV, B.B.	PA - 2247
TITLE	The Invariance Principle for a Homogeneous Medium of Arbitrary Shape (Pintsip invariantnosti dlya odnorodnoy sredy poizvol'noy geometricheskoy formoy).	
PERIODICAL	Doklady Akademii Nauk SSSR,1957,Vol 112, Nr 5,pp 831-834 (U.S.S.R.) Received 4/1957 Reviewed 5/1957	

ABSTRACT   The present paper applies the principle of invariance to media of arbitrary shape, a fact which is of interest for the theory of the dispersion of light and for some problems of neutron-physics. Dispersion is assumed not to change frequency (Generalisation for the case with a modification of frequency does not offer particular difficulties). The investigated medium is assumed to be homogeneous and limited by a convex surface S. The corresponding transfer-equation is invariant with respect to a small motion in space. Therefore the effect of such a transformation can be fully taken into account by a modification of boundary conditions. This is just what is maintained by the invariance principle in the general case.
First the transfer equation for the influence-function is written down. The medium is shifted by the infinitely small quantity ε in the direction of the unit vector $\vec{\varepsilon}$, on which occasion the locations of the source and of the observer remain unchanged. On this occasion the influence function G goes over into a new function G' which is obviously equal to the old influence function but in which the points of observer and source have shifted. On the other hand, such a shift

Card 1/2

is equivalent to a certain variation of density, where matter is removed one side and added on the other. The variation δG satisfies the transfer-equation and can therefore be represented by the influence-function. Next, an integral equation for G is derived, in which one integral vanishes because of the boundary conditions. Then space is turned round the infinitely small angle $\int$ round a certain point $\vec{R}$. The resulting modification of G is given. The six scalar equations which correspond to two vector-equations form the mathematical formulation of the invariance principle. For the determination of these equations their homogeneity is very essential.
The author applies the here obtained equations to the problem of the diffuse reflection of light on a homogeneous medium. The solution of this problem is reduced to the determination of the influence-function $G(\vec{\omega},\vec{r};\vec{\omega}_o,\vec{r}_0)$ on the condition that the points $\vec{r}_0$ and $\vec{r}$ are on the surface S. Here $\vec{r}$ denotes the radius vector of radiation plotted pointand $\vec{\omega}$ the direction of the radiation in the plotted point.(The source is at point $\vec{r}_0$ and emits radiation in the direction $\vec{\omega}_o$. In the case of isotropic scattering the equations can be simplified.
(No illustrations)

ASSOCIATION	Not given
PRESENTED BY	M.A.LEONTOVICH, member of the Academy, on 27. 9. 1956.
SUBMITTED	26. 9. 1956
AVAILABLE	Library of Congress

Card 2/2

On the Influence Function in the Theory of the Transport of Radiated Energy.

every solution of the above equation can be written down in the following form;

$$I(\nu,\vec{\omega},\vec{r},t) = \int g(\nu,\vec{\omega},\vec{r},t; \nu',\vec{\omega}',\vec{r}',t') j(\nu',\vec{\omega}',\vec{r}',t') d\nu' d\vec{\omega}' d\vec{r}' dt'$$

As an initial condition $I(\nu,\vec{\omega},\vec{r},t) = 0$ at $t = -\infty$ is used here. Further, the here investigated medium is assumed to be surrounded by a convex surface S, which surrounds all radiation sources. The following reciprocal theorem applies: The influence function satisfies the influence function conjugated with respect to the point of the source with the conjugated boundary conditions. If on the surface S a source exists which transmits the radiation into the outer space, no radiation exists in the interior of S. The conjugated equation can be applied successfully in those problems, in which any characteristics of the radiation in dependence on the parameters of the punctiform source have to be determined. From the general relation of the reciprocity the optical reversibility results as a special case. Problems further exist in which the intensity of the radiation must be determined only in a part of the medium limited by the surface S_1. In conclusion, the boundary conditions valid for S_1 are derived. (Ni illustrations).

Card 2/3

B. B. KADOMTSEV, (S. I. Braginsky)

"PLASMA STABILIZATION BY MEANS OF NON-UNIFORM MAGNETIC FIELDS"

by B. B. Kadomtsev, S. I. Braginskiy

Report presented at 2nd UN Atoms-for-Peace Conference, Geneva, 9-13 Sept 1958

KADOMTSEV, B. B

KADOMTSEV B.B., (Sagdeyev R.Z.), (Rudakov L.I.), (Vedenov A.A.)

"DYNAMICS OF RARE PLASMA IN A MAGNETIC FIELD" by R. Z. Sagdeyev,

B. B. Kadomtsev, L. I. Rudakov, A. A. Vedenov

Report presented at 2nd UN Atoms-for-Peace Conference, Geneva, 9-13 Sept 1958

BRAGINSKIY, S. I. and KADOMTSEV, B. B.

"Stabilization of Plasma with the Help of Shielding Conductors." (Work carried out in 1957); pp. 300-326.

"The Physics of Plasmas; Problems of Controlled Thermonuclear Reactions." Vol. III,
1958, published by Inst. Atomic Energy, Acad. Sci. USSR,
resp. ed. M. A. Leontovich, editorial work V. I. Kogan.

Available in Library.

KADOMTSEV, B. B.

"Magnetic Traps with "Gofrirovanoe" Field" (Work carried out in 1956); pp. 285-299.

"The Physics of Plasmas; PRoblems of Controlled Thermonuclear Reactions." Vol. III.
    1958, published by Ins.t Atomic Energy, Acad. Sci. USSR.
resp. ed. M. A. Leontovich, editorial work V. I. Kogan.

Available in Library.

KADOMTSEV, B.B.

21(7) $p.2,6,7.$ PHASE I BOOK EXPLOITATION   SOV/1244

Akademiya nauk SSR. Institut atomnoy energii

Fizika plazmy i problema upravlyayemykh termoyadernykh reaktsiy,
    t. IV. (Plasma Physics and the Problem of Controlled
    Thermonuclear Reactions, v. 4) [Moscow] Izd-vo AN SSSR, 1958.
    439 p. 3,000 copies printed.

Resp. Ed.: Leontovich, M.A., Academician.

PURPOSE: This collection contains previously unpublished work of
    members of the Institut atomnoy energii (Institute of Atomic
    Energy) of the Academy of Sciences of the USSR. It is intended
    for scientist interested in this field.

COVERAGE: This book is the last of four volumes of previously
    unpublished work of members of the Institute of Atomic Energy
    during the period of 1951-58. The exploitation cards on the
    other volumes in this series have been released under the
    numbers 1241, 1242, and 1243.

Card 1/8

Plasma Physics and the Problem (Cont.)   SOV/1244

Card 2/8

Plasma Physics and the Problem (Cont.)   SOV/1244

Card 3/8

Plasma Physics and the Problem (Cont.)   SOV/1244

Card 4/8

Plasma Physics and the Problem (Cont.)   SOV/1244

Andrianov, A.M., O.A. Basilevskaya, and Yu. G. Prokhorov.
    Investigation of a Pulse Discharge in Deuterium With Current
    Increase Speeds Up to 10^{12} A./Sec. and Voltages Up to   182
    120 kv.

Braginskiy, S.I., I.M. Gel'fand, and R.P. Fedorenko. Theory of Compression
    and Pulsation of a Plasma Column in a Strong Pulse Discharge . 201

Podgornyy, I.M., S.A. Chuvatin, G.A. Bykov. and V.D. Pis'mennyy.
    Investigation of the Process of Electrodynamic Acceleration   222
    of Plasma Clusters. II.

Yushmanov, Ye. Ye. Radial Distribution of the Potential in a
    Cylindrical Magnetic Trap by Use of the Magnetron Method of   235
    Ion Injection

Card 5/8

Plasma Physics and the Problem (Cont.)   SOV/1244

Card 6/8

Plasma Physics and the Problem (Cont.)   SOV/1244

List of Previously Published Reports on Plasma Physics and
    Problems of Controlled Thermonuclear   Reactions Made by Staff
    Members of the Institute of Atomic Energy of the Academy of   436
    Sciences of the USSR

AVAILABLE: Library of Congress   (QC794.A38)

                                        IS/ksv
                                        3-9-59

Card. 8/8

KADOMTSEV, B.B.; NEDOSPASOV, A.V.

[Instability of a positive column in a magnetic field,
and "anomalous" diffusion] Neustoichivost' pologhitel'-
nogo stolba v magnitnom pole i "anomal'naia" diffuziia.
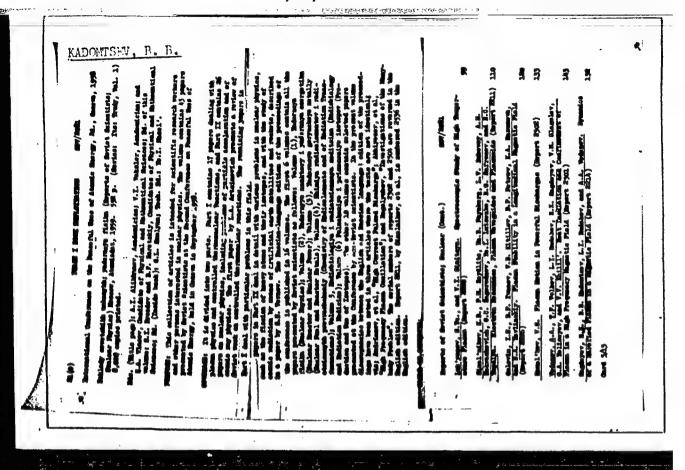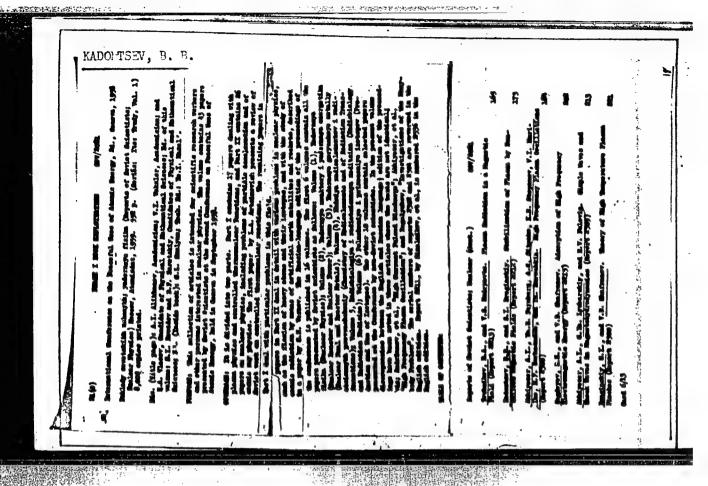Moskva, In-t atomnoi energii, 1959. 14 p.
(MIRA 17:2)

KADONTSEV, B. B.

KADOMTSEV, B. B.

KADOMTSEV, B.B.

24/3/20
AUTHORS: Granovskiy, V.L.: Luk'yanov, S.Yu.: Spivak, G.V. and Sirotenko, I.G.

TITLE: Report on the Second All-Union Conference on Gas Electronics

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8, pp 1335 - 1356 (USSR)

KADOMTSEV, B.B.

Convective instability of a plasma column. Zhur.eksp.i teor.
fiz. 37 no.4:1096-1101 O '59.   (MIRA 13:5)
          (Plasma (Ionized gases))

16.7800, 24.2000

76980
SOV/56-37-6-20/55

AUTHOR: Kádomtsev, B. B.

TITLE: Stability of a Low Pressure Plasma

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki,
               1959, Vol 37, Nr 6, pp 1646-1651 (USSR)

ABSTRACT: Equations were derived describing a local stability
               condition for an arbitrary toroidal system. The
               problem of stability of a low pressure plasma in
               such systems was discussed. The surface of constant
               pressure, p = const, in such systems is a family of
               toroidal surfaces enclosed in one another. The sur-
               face is also a plane that encompasses the force lines
               of the magnetic field and the current. The following
               functions of p were introduced according to the method
               of M. Kruskal, R. Kulsrud (cf., Second United Nations
               Intern. Conf. on the Peaceful Uses of Atomic Energy,
               Geneva, 1958, p/1876):

Card 1/5

Stability of a Low Pressure Plasma

$$\psi = \int H dS_2, \quad \chi = \int H \, dS_1;$$
$$I = \int J \, dS_2, \quad J = \frac{c}{4\pi} \int H \, dl_1 = \frac{c}{4\pi} \int H \, dl_0 - \int J \, dS_1. \qquad (1a)$$

Here, ψ - longitudinal magnetic flow through transverse cross section S_0 of the surface p = const; χ -azimuthal flow through surface S_1 passing through an arbitrary closed loop ℓ_1 parallel to the toroid p = const, and through magnetic axis ℓ_0 that is the limiting surface of equal pressure as the cross section of the surface approaches zero; I - longitudinal current; J - azimuthal current including the current in the outer circuit; Ω - volume of toroid p = const. The magnetic field in this geometry was represented in the form:

Card 2/5

Stability of a Low Pressure Plasma

76980
SOV/56-37-6-20/55

$$H = [\nabla\psi, \nabla\vartheta], \qquad (1)$$

where,

$$\vartheta = \theta' - \mu\zeta' + \lambda, \quad \mu = \mu(\psi) = d\chi/d\psi, \qquad (1b)$$

Here, λ is certain single-value function of the coordinate. As may be seen from this equation $H\nabla\vartheta = 0$, i.e., the relation $\vartheta = $ const defines the position of the force lines on the surface $\psi = $ const, and therefore the term μ represents the number of turns of the force line along the small perimeter on one passage around the toroid. The total energy E of small oscillations according to the hydrodynamic approximation was shown to be:

$$E = T + V = \frac{\omega^2}{2}\int\rho\eta^2 dr + \frac{1}{2}\int\gamma p(\operatorname{div}\eta)^2 dr + \frac{1}{8\pi}\int(\operatorname{rot}[\eta H])^2 dr - $$
$$- \frac{1}{8\pi}\int[\eta \operatorname{rot} H]\operatorname{rot}[\eta H]\, dr + \frac{1}{2}\int\eta\nabla p\operatorname{div}\eta\, dr, \qquad (4)$$

Card 3/5

Stability of a Low Pressure Plasma

76980
SOV/56-37-6-20/55

Here, ρ - density of plasma; ω - the increment, assuming that the shift of the plasma from the equilibrium position η changes with time according to the rule $e\omega^t$. For the system with sufficiently deep modulating field, the condition of the stability

$$\frac{d\rho}{d\psi}\left\{\frac{d^2\Omega}{d\psi^2} - \frac{I\mu'}{\mu I+J}\frac{d\Omega}{d\psi} + \frac{1}{\mu I+J}\left(\mu\frac{dI}{d\psi} + \frac{dJ}{d\psi}\frac{d\Omega}{d\psi}\right)\right\} > -\frac{R}{16\pi}\left(\frac{d\mu}{d\psi}\right)^2. \qquad (16)$$

can be expressed as:

$$\nabla\rho\nabla U < (\pi a^2/4\,|U|)(\nabla\mu)^2. \qquad (17)$$

The last equation can be interpreted as the affinity of the plasma to occupy a space with a minimum "potential energy" U. Such a transition is hindered by the crossover effect of the force lines. There are 7 references, 1 Soviet, 2 German, 2 U.K., 2 U.S. The U.K. and U.S. references are:

Card 4/5

Stability of a Low Pressure Plasma

76980
SOV/56-37-6-20/55

M. Kruskal, R. Kulsrud. Second United Nations
Intern. Conf. On the Peaceful Uses of Atomic Energy,
Geneva, p/1876; J. Bernstein, E. Frieman, M. Kruskal,
K. Kulsrud, Proc. Roy. Soc. A224, 19, 1958; B. Suydam.
Second United Nations Intern. Conf. On the Peaceful
Uses of Atomic Energy, Geneva, 1958, p/354; J. Johnson,
C. Oberman, R. Kulsrud, E. Frieman, Second United
Nations Intern Conf. On the Peaceful Uses of Atomic
Energy, Geneva, 1958, p/2170.

SUBMITTED: July 29, 1959

Card 5/5

S/020/60/133/01/18/070
B014/B011

AUTHORS: Kadomtsev, B. B.,   Rokotyan, V. Ye.

TITLE: The Stability of a Plasma in the Field of a Magnetic Dipole

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 1,
              pp. 68-70

TEXT: The surface of the Earth with its relatively near ionosphere is an
ideal electric conductor, and therefore, the tangential component of the
electric field is equal to zero. This leads to a forbiddenness of convec-
tive instability, i.e., to a stabilization of plasma. This effect is in-
vestigated with the aid of an energy principle according to which it is
necessary and sufficient for the stability that the potential energy V of
the small oscillations be positive. The general expression (2) for the
potential energy is transformed into (5) by proceeding from the assumption
of the Earth being an ideal conductor. (6) is obtained as a minimum of
(5), and with the variation of (6) the authors arrive at the same problem
as arises in quantum mechanics on the motion of particles in a potential
well U. Thus, the condition desired for stability is derived from

Card 1/2

The Stability of a Plasma in the Field of a   S/020/60/133/01/18/070
Magnetic Dipole   B014/B011

inequality (7). By considering the longitudinal shift, condition (7) ob-
tains the form of (8). Finally, a numerical integration leads to (9),
which, compared to inequality (1) (which holds for an exact dipole),
allows the study of the deviation of the geomagnetic field from that of
a dipole. There are 7 references: 3 Soviet, 3 American, and 1 British.

PRESENTED: February 29, 1960, by M. A. Leontovich, Academician

SUBMITTED: January 4, 1960

Card 2/2

$\checkmark$ C

10.2000

26.7211

28774 S/057/61/031/010/007/015
B104/B125

AUTHOR: Kadomtsev, B. B.

TITLE: Turbulent particle leakage from a discharge in a strong
             magnetic field

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 10, 1961, 1209-1219

TEXT: Previous articles on the hydrodynamic instability of weakly
ionized plasmas are discussed in the introduction. The intensified
diffusion of charged particles from the positive column of a glow dis-
charge through a longitudinal magnetic field, which has been established
by B. Lehnert et al. (Report P/146 on the Second Intern. Conf. on the
Peaceful Uses of Atomic Energy, Geneva, 1958; Phys. of Fluids, $\underline{3}$, 600,
1960), may explain instabilities of this kind. As is shown here, a
similar instability may also occur in a completely ionized plasma. Only
disturbances of temperature in a stabilized plasma filament produce in-
stabilities. Such instabilities are called convection instabilities,
because a turbulent convection, and thus, heat convection are caused
thereby. It is shown that turbulent convection effects plasma cooling

Card 1/2

28774   S/057/61/03?/0?0/007/C?
B104/B125

Turbulent particle...

and particle leakage to the wall. A coefficient of turbulent diffusion
is introduced to estimate the lifetime τ_0 in plasma. An experimental
value of $1.7 \cdot 10^{-4}$ sec is obtained for the lifetime of particles in a
stellarator with a diaphragm (radius a = 1.4 cm, H = $3 \cdot 10^4$ oe). The
theoretical value is about $3 \cdot 10^{-4}$ sec. The conclusion is attained that
the convection studied and the intensified particle diffusion from
the positive column in a magnetic field constitute two limiting cases of
one and the same effect, i. e., convection instability. A weakly and a
strongly ionized plasma differ merely in that in the latter δ depends
only on temperature, while in the former δ is proportional to the density.
There are 1 figure and 8 references: 2 Soviet and 6 non-Soviet. The five
most important references to English-language publications read as
follows: T. Coor et al., Report P/362 on the Second Intern. Conf. on the
Peaceful Uses of Atomic Energy, Geneva, 1958; R. A. Ellis et al., Phys.
of Fluids, 3, 468, 1960; J. B. Bernstein et al., Phys. of Fluids, 3, 136,
1960; L. Spitzer, Phys. of Fluids, 3, 659, 1960; B. B. Kadomtsev et al.,
J. of Nucl. Energy Part, C, 1, 230, 1960.

SUBMITTED: January 9, 1961
Card 2/2

26.7310

30086
S/057/61/031/011/001/019
B104/B108

AUTHOR: Kadomtsev, B. B.

TITLE: Plasma convection in the positive column in a magnetic field

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 11, 1961, 1273 - 1283

TEXT: The author investigates the turbulent convection of slightly ionized plasma in a positive column, which is caused by current instabilities when a sufficiently strong longitudinal magnetic field is applied. In a study of the current-convection instabilities, the dispersion relation

$$\omega = (k_z v_0 - i D_e k_z^2) \frac{b_e k_z^2 + \frac{b_i k_\perp^2}{1+(\Omega\tau)^2} - i \frac{k_y c}{H} \frac{(\Omega\tau)^2}{1+(\Omega\tau)^2} \frac{d \ln n}{dx}}{b_e k_z^2 + \frac{b_i k_\perp^2}{1+(\Omega\tau)^2} + i \frac{k_y c}{H} \frac{1}{1+(\Omega\tau)^2} \frac{d \ln n}{dx}} . \tag{4}$$

is derived, where b_e and b_i are the electron and ion mobilities, respectively; Ω is the ion cyclotron frequency, and D_e is the diffusion coeffi-

Card 1/4

χ

Plasma convection in the positive ...

30086
S/057/61/031/011/001/019
B104/B108

cient. For strong magnetic fields, i. e. $(\Omega\tau)^2 \gg 1$, the imaginary part of the complex frequency ω is

$$\operatorname{Im}(\omega) = b_i E \sqrt{\frac{b_e}{b_i}} \frac{d \ln n}{dx} \cdot \frac{x}{1+x^2} \frac{k_y}{k_\perp} - D_e \frac{b_i k_\perp^2}{b_e (\Omega\tau)^2} \frac{x^2}{1+x^2}. \tag{6}$$

This expression is discussed for different conditions, and it is shown that it can also be used for the case $\Omega\tau \sim 1$. The turbulent convection of plasma in a strong magnetic field is represented similarly to the flow of an inhomogeneous incompressible liquid through a porous medium (cylindrical coordinates):

$$-n\mathbf{u} - n\frac{b_e}{b_i}k^2(\Omega\tau)^2 r^2 u_r \mathbf{r}_0 + k\Omega\tau v_0 n r \mathbf{r}_\theta - \frac{1}{\Omega\tau}n[\mathbf{h}\mathbf{u}] = \nabla p, \tag{11}$$

$$\frac{\partial n}{\partial t} + \mathbf{u}\nabla n + \operatorname{div}\left(\frac{n}{\Omega\tau}[\mathbf{h}\mathbf{u}]\right) = 0. \tag{12}$$

$$\operatorname{div} u = 0, \tag{13}$$

where $\vec{u} = \frac{c}{H}\left[\vec{h}\nabla\varphi\right]$; $\vec{r}_0$ is the radial unit vector; and p is an arbitrary

Card 2/4

30086
S/057/61/031/011/001/019
B104/B108

Plasma convection in the positive ....

function of r and ψ; $\psi = \vartheta + kz$. In a study of the turbulent convection in a tube with a non-conducting wall, expressions are derived for the pulsations of the longitudinal and transverse components of the electric field. The method used to study the turbulent convection is checked by a comparison of theoretical and experimental results (F. C. Hoh, B. Lehnert, Phys. of Fluids, 3, 600, 1960; A. A. Zaytsev, M. Ya. Vasil'yeva, ZhETF, 38, 1639, 1960; A. Simon, Report P/366 on the Second Intern. Conf. on the Peaceful Uses of Atomic Energy, Geneva, 1958; E. M. Reykhrudel', G. V. Spivak, ZhETF, 10, 1408, 1940; I. A. Vasil'yeva, Radiotekhnika i elektronika, 5, 2015, 1960). The theoretical curve ($\Theta_\mathrm{s} = E_\mathrm{s}/E_\mathrm{o}$) versus

ap (a is the tube radius) is in good agreement with experimental results. A study of turbulent diffusion in a very long tube with conducting walls adjusted to the lines of force has shown that in a smooth metallic tube the electron density is constant everywhere, except in the immediate neighborhood of the wall. If the walls are rough, the character of diffusion near the walls is entirely different. Considerable diffusion occurs in the laminar layer. A. Engel' (Ionizovannyye gazy, Fizmatgiz, 1959) is mentioned. The author thanks A. V. Nedospasov for discussions.

X

Card 3/4

Plasma convection in the positive ...

30086
S/057/61/031/011/001/019
B104/B108

There are 3 figures and 18 references: 8 Soviet and 8 non-Soviet. The four most recent references to English-language publications read as follows: T. K. Allen, G. A. Paulikas, R. V. Pyle. Phys. Rev. Lett., 5, 409, 1960; R. A. Ellis, L. P. Goldberg, J. G. Gorman. Phys. of Fluids, 3, 468, 1960; C. Ekman, F. C. Hoh, B. Lehnert. Phys. of Fluids, 3, 833, 1960; F. C. Hoh, B. Lehnert. Report III b, 25 on the Fourth Intern. Conf. on Ionization Phenomena in Gases, Uppsala, 1959.

SUBMITTED: March 4, 1961

Card 4/4

X

KADOMTSEV, B.B.

Stability of a low-pressure plasma. Zhur.eksp.i teor.fiz. 37
no.6:1646-1651 D '61.   (MIRA 14:10)
                    (Plasma (Ionized gases))

69225

S/056/61/040/001/031/037
B102/B212

26.2321

AUTHOR: Kadomtsev, B. B.

TITLE: Turbulence of plasma in a magnetic mirror trap

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40,
no. 1, 1961, 328-336

TEXT: The present paper brings a contribution to the problem of
retaining high-temperature plasma in a magnetic mirror trap. This in-
vestigation was suggested by experiments of M. S. Ioffe et al., where
the lifetime of plasma had been determined for such cases and also the
escape effects had been studied. Here, the author considers a single
plasma column ABCDE in a mirror trap which is shown schematically in
Fig.1. If the electron energy is of the order of 10 ev at an ion energy
of the order of 1 kev, then electrons are taken to be "cold", and $T_e = 0$

may be written. For the potential φ along a plasma column the condition
$0 < \varphi < (T/e)(H_m/H_s - 1)$ has to be fullfilled, T denoting the ion temperature,
H_s the field strength on the surface, and H_m the field strength in the

Card 1/5

69225

Turbulence of plasma in a...

mirror. The electric contacts at the tube ends are discussed and the problem of convective instability is examined. The theoretical analysis is limited to such a diluted plasma that collisions between particles can be neglected, viz., the authors proceed from a kinetic equation without the collision term. Furthermore, a convection current is assumed with a frequency which is very small compared with the cyclotron frequency, and its characteristic length large compared with the Larmor frequency, so that for a zero approximation, the last term of the equation of motion can be dropped: $\frac{\partial f}{\partial t} + (\vec{v}\nabla)f + \frac{e}{M}\{\vec{E} + \frac{1}{c}[\vec{v}\vec{H}]\}\frac{\partial f}{\partial \vec{v}} = 0$. For a small H_x/H_o (H_o denotes the homogeneous magnetic field) and magnetic field lines with light curvature the transverse motion is described by:

$$Mn\left\{\frac{\partial \vec{v}_o}{\partial t} + (\vec{v}_o\nabla)\vec{v}_o\right\} + \nabla p + en\nabla\varphi - \frac{ne}{c}[\vec{v}_o\vec{H}] = Mn\vec{g}, \text{ where } n = \frac{H_o}{L}\iint f d\vec{v}\,\frac{dl}{H}$$

denotes the mean density in the plasma column with a mean length L, $p = (H_o/L)\int (p_\perp/H)dl$ is the mean transverse pressure, $\vec{g}$ is radially oriented and amounts to

Card 2/5

$$\mathcal{E} = \frac{1}{MnL} \int (p_\perp + p_H) \frac{H_0^2 r_0}{H^2 R r} \, dl \approx \frac{1}{MnL} \int (p_\perp + p_H) \frac{H_0^{3/2}}{R H^{3/2}} \, dl,$$ H_0 is the field in the center of the trap, $r = r(z)$ the distance from the line of force to the axis of the system, $r_0 = r(z=0)$, dl is an element along the line of force, R is the radius of curvature, $p_\perp = \int (Mw^2/2) f \, d\vec{v}$; $f = F(\vec{v} - \vec{v}_0)$, $\vec{v}_0 = H^{-2} c [\vec{E}\vec{H}]$, $\vec{w} = \vec{v} - \vec{u}\vec{H}/H$, $\vec{u}$ is the longitudinal, and $\vec{v}$ the total velocity. The electric field is given by $\Delta\varphi = -4\pi e(n - n_e)$; the equations of continuity for ions and electrons read: $\partial n/\partial t + \mathrm{div}(\vec{v}_0 n) = 0$, $\partial n_e/\partial t + \vec{v}_e \nabla n_e = 0$. The degree of density at which the plasma will become unstable is determined next. The frequency is given by $\omega = -\frac{1}{2} m\omega_0 \pm m\sqrt{\frac{1}{4}\omega_0^2 - 2\Omega_0^2 \omega_0/\Omega_H \alpha_{mn}^2}$, with $\Omega_0^2 = 4\pi e^2 N/M$. An instability will occur only at densities with $\Omega_0^2 \frac{1}{8}\alpha_{mn}^2 \omega_0 \Omega_H$. Stability can be approximated on the condition that $r_d^2 > a R_0$, with $r_d^2 = T/M\Omega_0^2$ denoting the square of the Debye radius, a the radius of the

Card 3/5

89225
S/056/61/040/001/031/037
B102/B212
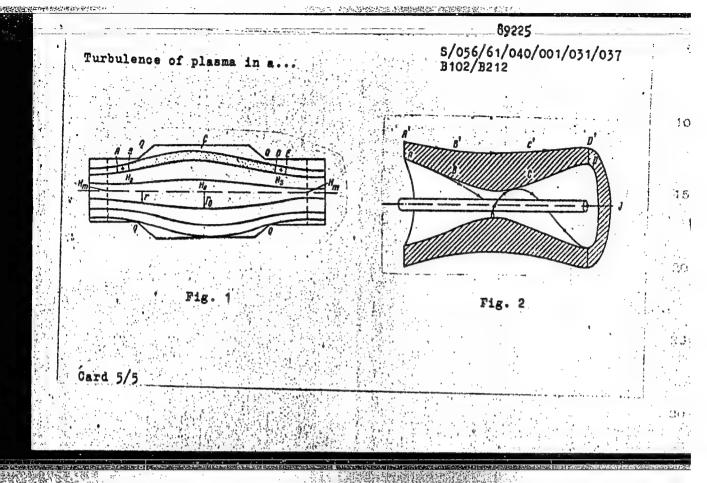
Turbulence of plasma in a...

chamber, R_o the radius of curvature for the lines of force near the wall.
The turbulent convection is studied next; and after extensive calculations
the following expression is found with an electron distribution near the
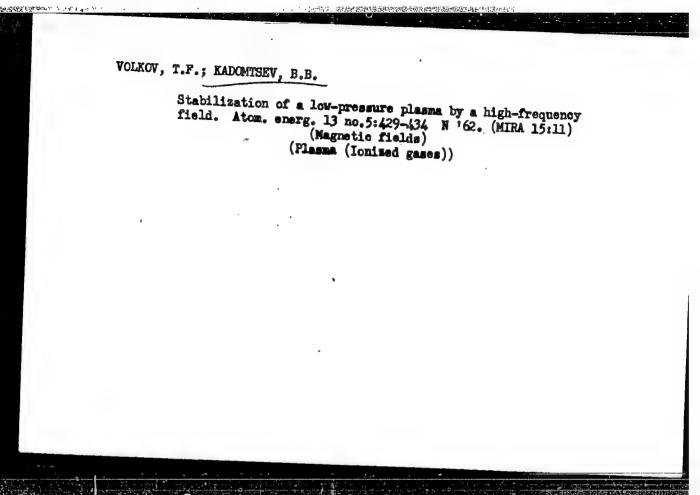wall $n_o = N-3q/A(s^x q)^{1/3} x^{1/3}$ for the plasma lifetime:

$$\tau_o \approx \frac{xa^2 N}{2 x_a q} = Ca \left(\frac{\Omega^2_H + \Omega^2_o}{\Omega^2_o} \frac{R_o N}{qT} \right)^{1/2}, \quad C = \frac{1}{2}(\frac{2+3\xi}{A\xi})^{3/2}; \quad \xi \sim 1; \quad A \text{ is also a numerical}$$

coefficient of the order of one, $q = -Ddn_o/dx$, $N = $ const, the density in-
side the chamber, i.e., at $x \to \infty$; D is the coefficient of turbulent
diffusion. The results agree well with experimental data of Ioffe,
R. I. Sobolev, V. G. Tel'kovskiy, Ye. Ye. Yushmanov (Refs.6,7). The author
thanks M. S. Ioffe and V. G. Tel'kovskiv for discussions. L.A.Artsimovich
is mentioned. There are 2 figures and 7 references; 3 Soviet-bloc and
4 non-Soviet-bloc.

SUBMITTED: August 3, 1960

Card 4/5

Turbulence of plasma in a...

Fig. 1

Fig. 2

Card 5/5

VOLKOV, T.F.; KADOMTSEV, B.B.

Stabilization of a low-pressure plasma by a high-frequency
field. Atom. energ. 13 no.5:429-434 N '62. (MIRA 15:11)
(Magnetic fields)
(Plasma (Ionized gases))

KADOMTSEV, B.B.

"Anomalous" diffusion of a rarefied plasma with a current
in a magnetic field. Zhur. eksp. i teor. fiz. 43 no.5:1688-1696
N '62.
(MIRA 15:12)
(Plasma (Ionized gases))
(Magnetic fields)

KADOMTSEV, B.B.; PETVIASHVILI, V.I.

A weakly turbulent plasma in a magnetic field. Zhur.eksp.i
teor.fiz. 43 no.6:2234-2244 D '62.   (MIRA 16:1)
(Plasma (Ionized gases))   (Magnetip fields)

KADOMTSEV, B.B.; TIMOFEYEV, A.V.

Drift instability of an inhomogenous plasma in a magnetic field.
Dokl. AN SSSR 146 no.3:581-584 S '62.

(MIRA 15:10)

1. Chlen-korrespondent AN SSSR (for Kadomtsev).
    (Plasma (Ionized gases))   (Magnetic fields)

KADOMTSEV, B. B.

Dissertation defended for the degree of <u>Doctor of Physicomathematical</u> <u>Sciences</u> at the Technical Physics Institute imeni A. F. Ioffe in 1962:

"Convection of Plasma in the Magnetic Field."

Vest. Akad. Nauk SSSR.   No. 4, Moscow, 1963, pages 119-145

KADOMTSEV, B.B

Hydromagnetic stability of a plasma. Vop. teor. plaz. no.2;
132-176 '63.
(MIRA 17:2)

L 18883-63
AFWL/IJP(C)/SSD   EPF(n)-2/EWG(k)/EWT(1)/BDS/ES(w)-2   AFFTC/ASD/ESD-3/
ACCESSION NR: AP3003033   Pu-4/Pz-4/Pi-4/Po-4/Pab-4   AT

S/0025/63/000/006/0016/0018

AUTHOR: Kadomtsev, B. (Corresponding Member of the Academy of Sciences, SSSR)

TITLE: The taming of the shrew continues [plasma research]

TOPIC TAGS: plasma-producing unit, magnetic trap, plasma leak, PR-5 reactor, plasma temperature, plasma density, plasma life

ABSTRACT: The main draw back of all existing plasma-producing units (e.g. the doughnut-shaped ones such as the "Takemak" at the Institut atomnoy energii imeni I. V. Kurchatova (Atomic-Energy Institute), the British "Zeta", the US "Stellarator", the magnetic traps such as the SSSR "Ogra", the US "D-C-X") is that the plasma lasts less than the time needed to create the magnetic field. This problem confronted M. S. Ioffe, V. G. Tel'kovskiy, R. I. Sobolev and Ye. Ye. Yushmanov of the Institute of Atomic Energy when they began to study plasma in the Ioffe trap with magnetic plugs. This separates the processes of creating and heating the plasma. First, plasma is created in the plasma source (in the end of the trap) by ionizing neutral gas entering the source around the electron-emitting cathode. The ionized substance moves along the magnetic lines of force into the trap with magnetic plugs. The
Card 1/2

L 18883-63

ACCESSION NR: AP3003033

plasma obtained has high density and low temperature. Between the plasma "string" and the walls of the chamber is inserted an additional electric field of several tens of kilovolts, which heats the plasma. Then the electric field is turned off and the high-temperature plasma studied. The first tests showed that the plasma was unstable, lasting not more than a millisecond. A plasma leak was caused by convective instability. It was thrust out toward the weaker magnetic field, touched the walls and vanished. They built a new unit, the "PR-5" (shown in the photo), alongside which additional conductors with current were installed. The magnetic field created by these lines was to repel the plasma from the chamber walls. Ioffe, Sobolev, Yu. T. Bayborodov and V. M. Petrov obtained plasma with the "PR-5" with a life of more than 15-20 milliseconds, a temperature of 40 million degrees, density 10 sup 9 - 10 sup 10 particles per cu cm--a great triumph of Soviet physicists, inspiring the hope that a stable plasma in which a thermonuclear reaction can be brought about will be produced "after some time." Orig. has 1 photo.

ASSOCIATION: AN SSSR   (Academy of Sciences of the SSSR)

SUBMITTED: 00

SUB CODE: PH

Card 2/2

DATE ACQ: 23Jul63

NO REF SOV: 000

ENCL: 00

OTHER: 000

KADOMTSEV, B.B.

Symposium on the stability of plasma. Vest.AN SSSR 33
no.2:101-102 F '63.
(MIRA 16:2)

1. Chlen-korrespondent AN SSSR.
(Plasma (Ionised gases))

KADOMTSEV, B.B.

Turbulent diffusion of a rarefied plasma in a high magnetic
field. Zhur. eksp. i teor. fiz. 45 no.4:1230-1242 0 '63.
(MIRA 16:11)

KADOMTSEV, B.B.

Turbulence of a plasma. Vop. teor. plaz. no.4:188-339 '64.

(MIRA 17:11)

ABSTRACT: It is shown that nonequilibrium transparent media can exhibit anomalous
dispersion, in which case the energy of a monochromatic electromagnetic wave can
become negative, i.e., the energy of the medium is lower in the presence of the
wave than in its absence. An example of such a medium is a plasma in a magnetic
field with a configuration that is either anisotropic (with beams) or spatially
inhomogeneous. Another example is an inhomogeneous plasma in a strong magnetic
field with Maxwellian electron and ion distributions. A negative-energy wave can
exhibit many unusual features when it interacts with matter or with other waves.
For example, introduction of ordinary dissipation does not lead to time-attenuation

Cord 1/2

L 23083-65
ACCESSION NR: AP5001850

of the wave, but to growth. A similar amplification effect arises when the wave
is reflected from the boundary of a medium in which the dispersion is of the op-
posite sign. Related effects are the reflection of a sound wave from a ....
stream, and the production of pairs of waves with positive and negative ....
turbed surface with infinite reflection coefficient (Cerenkov emission ....
waves) or in an infinite plasma at rest when the dispersion equation has ....
roots. It is shown by an example that negative energy can be ....
the directed velocity of electrons in a weakly ionized plasma in a ....
electric field is much smaller than the thermal conductivity. Negative ....
effects can also be produced by nonlinear interactions between waves. Cases when
the negative-energy effect is only apparent and can be removed by conversion ....
another coordinate system are discussed. Orig. art. has: 4 figures.   [02]

ASSOCIATION: None

SUBMITTED: 23Jun64   ENCL: 00   SUB CODE: ME, GP

NO REF SOV: 005   OTHER: 000   ATD PRESS: 3175

Card 2/2

AUTHOR: Kadomtsev, B. B. (Corresponding member AN SSR)

.... investigations of plasma instability

TOPIC TAGS: plasma instability, turbulence, linear differential equation, kinetic
method, magnetic field, drift current, MHD flow

ABSTRACT: A summary review is given of various problems in plasma insta...
At the present, most plasma instability analyses are resti.........
linearized equations of motion. However, even small plasma oscillations require
elaborate numerical calculations in order to correspond to experimental observations
if plasma kinetic equations are used. To simplify the ......
macroscopic instabilities and microscopic instabi..... ... two general groups:

L 35413-65
ACCESSION NR: AP5008086

whereas finite installations are reduced by a field which...

SUBMITTED: ENCL:

Card 2/2

L 3033-66   EWT(1)/ETC/EPF(n)-2/EWG(m)/ZPA(w)-2   LJP(c)   AT

TOPIC TAGS: turbulent plasma, plasma instability, plasma magnetic field, plasma
diffusion, nonlinear plasma, plasma oscillation, mathematic physics

ABSTRACT: This 150 page review article with over 200 references is a small trea-
tise on the theory of turbulent plasmas. Only those processes are discussed that
might occur in the laboratory, however; astrophysical applications are ignored and,
in particular, magnetohydrodynamic turbulence and turbulent shock waves are not
discussed. Turbulence is defined as the simultaneous excitation of many collec-
tive degrees of freedom. Owing to its many possible varieties of collective mo-
tion, a turbulent plasma often bears little resemblance to a turbulent hydrodynamic
flow, the turbulence frequently consisting in the disordered excitation of wave
motions rather than of localized vortices. The turbulence of a plasma is called
weak when the interactions between the different waves are small. In the first
section a weakly turbulent plasma is treated in the quasilinear approximation,
where one neglects the interactions between the waves but takes account of thermal
Card 1/3

L 3033-66

O

ACCESSION NR: AT5021032

motions and the effect of the oscillations on the averaged velocity distribution function. Among the matters discussed in this approximation are laminar convection, excitation of Langmuir waves by a charged particle beam, and resonance interaction between a wave and particles whose thermal velocity is equal to the phase velocity of the wave. In the next approximation one considers the merging of two waves into a single one and the break up of a single wave into two others, with conservation of total frequency and wave number. The kinetic equation describing these processes is derived and is illustrated by a discussion of the interaction of Langmuir waves with ionic sound and of Alfven waves with magnetic sound. The wave kinetic equation is generalized to take account of thermal motions and the scattering of waves on particles. When the interaction terms in the wave kinetic equation are increased one obtains the weak coupling approximation to strong turbulence, in which the turbulent motion is described by two coupled nonlinear integral equations for the spectral density of the oscillations and the Green's function giving the reaction to an external force. When R.H.Kraichnan discussed hydrodynamic turbulence in this approximation (J.Fluid. Mech., 5, 497, 1959) he obtained a spectrum differing from that of Kolmogorov. It is shown that this was due to neglect of the adiabatic interaction between short and long wavelength oscillations; this defect of Kraichnan's theory is corrected. A phenomenological approach to the description of a turbulent plasma, employing the concept of mixing length

Card 2/3

L 3033-66

ACCESSION NR: AT5021032

borrowed from hydrodynamic turbulence theory, is discussed briefly. The author has successfully employed this approach to treat turbulent diffusion in a magnetic mirror system and in a glow discharge positive column. It is illustrated here by a discussion of the turbulent jet and a derivation of the Kolmogorov-Obukhov-Heisenberg 5/3-power law. In the final section there are discussed several specific questions involving strong turbulence. These questions include that of turbulent diffusion in a magnetic field. It is shown that drift-dissipative instability in a dense plasma can give rise to diffusion with a value of the diffusion constant of the order of Bohm's phenomenological value. The survey concludes with a brief discussion of experimental material on turbulent heating of plasmas, anomalous diffusion, and turbulence in toroidal discharges and magnetic mirror systems. The author concludes that at the present time there are no significant difficulties of principle that could hinder further development of the theory of turbulent plasmas. The survey article under review is to be published in England in "Progress in Plasma Physics". Orig. art. has: 513 formulas and 30 figures.

ASSOCIATION: none

SUBMITTED: 00   ENCL: 00   SUB CODE: ME

NO REF SOV: 114   OTHER: 102

Card 3/3

L 36248-66   EWT(1)   IJP(c)   AT

ACC NR: AP6023634   SOURCE CODE: UR/0386/66/004/001/0015/0019

AUTHOR: Kadomtsev, B. B.

ORG: none

TITLE: Instability of plasma on trapped particles

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 1, 1966, 15-19

TOPIC TAGS: plasma instability, magnetic mirror machine, magnetic trapping/ Tokomak plasma machine

ABSTRACT: The author discusses a plasma instability which can arise in a plasma contained in a magnetic-mirror or a toroidal trap if the magnetic field configuration is such that there are present in the mirror particles that oscillate between the magnetic mirrors so that an instability called "trapped-particle instability" sets in the plasma. It differs from flute instability in that the charges due to the trapped particles are cancelled out to a considerable degree by the particles that can move freely along the force lines (transit particles). The growth increment of the instability is calculated in the quasiclassical approximation, and it is shown that in general trapped-particle instability is most likely to develop in a system with a moderately inhomogeneous magnetic field. This instability should cause ejection of the captured particles, and then collisions or instabilities induced by high-frequency longitudinal oscillations will cause plasma leakage out of the trap. Trapped-particle

Card 1/2

L 36248-66

ACC NR: AP6023634

instability cannot occur in a dense plasma, and is also suppressed in a rarefied plasma under certain favorable directions of the particle drift, such as occur in apparatus of the Tokomak type. A detailed investigation of the trapped-particle instability in a Tokomak toroidal discharge was made by the author jointly with O. P. Pogutse. Orig. art. has: 4 formulas.

SUB CODE: 20/   SUBM DATE: 27Apr66/   ORIG REF: 004/   OTH REF: 003

Card 2/2

L 05704-67   EWT(1)   IJP(c)   AT

ACC NR: AP6013897   SOURCE CODE: UR/0020/66/167/006/1273/1275

AUTHOR: Kadomtsev, B. B. (Corresponding member AN SSSR); Shafranov, V. D.

ORG: none

TITLE: Diffusion in a toroidal discharge plasma

SOURCE: AN SSSR. Doklady, v. 167, no. 6, 1966, 1273-1275

TOPIC TAGS: plasma diffusion, plasma pinch, plasma discharge / Tokamak plasma device, stellarator plasma device

ABSTRACT: A formula is derived for the diffusion current of a plasma in a toroidal axiosymmetric discharge, assuming an external vortex electric field. The equations of V. D. Shafranov (*Voprosy teorii plazmy*, v. 1, M., 1963) are used to describe a system with this particular geometry. The average expansion rate of the plasma cord is given as the sum of terms representing the anomalous diffusion rate, the rate of pinch and two types of drift associated with the vortex field and the toroidal geometry. This expression is discussed in terms of experiments on Tokamak and stellarators. Orig. art. has: 15 formulas.

SUB CODE: 20/   SUBM DATE: 20Jan66/   ORIG REF: 004/   OTH REF: 002

UDC: 533.932

Card 1/1

ACC NR: AP6033267   SOURCE CODE: UR/0020/66/170/004/0811/0814

AUTHOR: Kadomtsev, B. B. (Corresponding member AN SSSR); Pogutse, O. P.
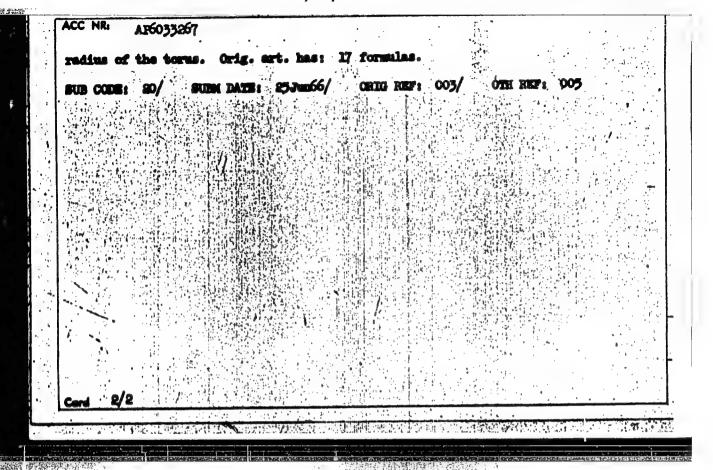
ORG: none

TITLE: Flute instability of a plasma in toroidal geometry

SOURCE: AN SSSR. Doklady, v. 170, no. 4, 1966, 811-814

TOPIC TAGS: plasma instability, magnetic trapping, plasma magnetic field

ABSTRACT: The authors consider flute instability of an ideally conducting plasma in toroidal discharge with strong longitudinal magnetic field, such as in the Tokamak system. The stability is defined by means of Suydam's condition (Second UN Conference on Peaceful Uses of Atomic Energy, Geneva, 1958, p. 354). It is shown that this condition is not applicable to Tokamak systems in strong magnetic fields, since the flute instability arises in final analysis as a result of the bending of the force lines. A different stability criterion is derived from the balance equation, which is linearized under certain simplifying assumptions. It is assumed that the flute instability arises under perturbations which are strongly stretched along the force lines. The maximum radius of the torus under which the straight-line approximation is still valid is estimated. The final criterion obtained for the stabilization of the flute instability is $\beta_\varphi = 8\pi p/H_\varphi^2 < 1$, where p is the plasma pressure and H_φ the azimuthal magnetic field, under the assumption that p does not vary too smoothly with the small

Card   1/2

ACC NR: AP6033267

radius of the torus. Orig. art. has: 17 formulas.

SUB CODE: 20/   SUBM DATE: 25Jun66/   ORIG REF: 003/   OTH REF: 005

Card 2/2

ACC NR: AP7003215   SOURCE CODE: UR/0056/66/051/006/1734/1746

AUTHOR: Kadomtsev, B. B.; Pogutse, O. P.

ORG: none

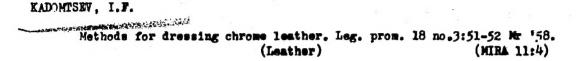TITLE: Instability of a plasma due to particle trapping in a toroidal geometry

SOURCE: Zh eksper i teor fiz, v. 51, no. 6, 1966, 1734-1746

TOPIC TAGS: plasma instability, magnetic mirror machine, magnetic trapping, dispersion equation, particle collision

ABSTRACT: The article is devoted to a special type of flute instability occurring in a mirror device, first described in an earlier paper (ZhETF Pis'ma v. 4, 15, 1966) and called "trapped-particle" instability. In such an instability which a collisionless plasma can develop in a toroidal discharge with longitudinal magnetic field, the untrapped particles play the role of an environmental medium characterized by a high dielectric constant. These particles can only reduce the potential associated with the trapped particles but cannot eliminate it completely. The toroidal system considered is of the Tokomak type. The equilibrium state is analyzed and the drift trajectories of the particles are determined in a specially chosen coordinate frame. An integral equation playing the role of a dispersion relation for the determination of the characteristic oscillation frequency is derived and investigated. The case of particle collisions and instability by the trapped particles is then analyzed. The particles trapped between the effective magnetic mirrors in the toroidal configuration are

Card   1/2

ACC NR: AP7003215

capable of giving rise to instability in a collisionless plasma. If the plasma densi-
ty is sufficiently high, the instability becomes dependent on the sign of the magnetic
drift. As the collision frequency increases, the growth rate for this instability
falls off rapidly so that the trapped particle instability is insignificant in a
sufficiently dense plasma. Orig. art. has: 2 figures, 46 formulas, and 1 table.

SUB CODE: 20/   SUBM DATE: 19Apr66/   ORIG REF: 008/   OTH REF: 003

Card 2/2

KADOMTSEV, I.F.

Methods for dressing chrome leather. Leg. prom. 18 no.3:51-52 Mr '58.
                    (Leather)   (MIRA 11:4)

KADOMTSEV, I.F.

Method for processing pickled raw materials. Kozh.-obuv.prom. 5 no.3:
36-37 Mr '63.
(MIRA 16:3)

(Leather)

24(3)

AUTHORS: Belov, K.P. and Kadomtseva,A.M.   SOV/55-58-2-17/35

TITLE: On the Influence of One-Sided Elastic Deformations on the
              Curie Point of   Ferromagnetica (O vliyanii odnostoronnikh
              uprugikh deformatsiy na tochku Kyuri ferromagnetikov)

PERIODICAL: Vestnik Moskovskogo Universiteta,Seriya matematiki, mekhaniki,
              astronomii, fiziki, khimii,   1958,Nr 2,pp 133-136 (USSR)

ABSTRACT: An experimental investigation of the influence of uni-
              directional elastic tensions on the Curie point led to the
              following results: The displacement of the Curie point under
              unidirectional tension is three times smaller than under
              universal tension and is essentially caused by the change in
              volume which follows the tension. A torsion does not dis-
              place the Curie point.
              There are 3 figures, and 6 references, 4 of which are Soviet,
              and 2 American.

ASSOCIATION: Kafedra obshchey fiziki dlya biologo-pochvennogo i dr. f-tov
              (Chair of General Physics of the Faculty of Soil Biology
              and other Faculties) [Moscow Univ.]

SUBMITTED: June 26, 1957

Card 1/1